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ABSTRACT

The relationships between industry and state colleges and universities were investigated, with attention to member institutions of the American Association of State Colleges and Universities. A survey was conducted of 236 public institutions that offered degrees in the liberal arts and at least two professional fields. Of the 66 institutions that were active in four or more industry-related programs, 57 responded to the survey. The industry-related programs were divided into two types: (1) collaborative research mechanisms that are designed to foster joint research projects or less formal cooperative research relationships; and (2) knowledge transfer mechanisms or broad-based information exchange between universities and industry. The following eight programs were represented: government-funded university research assisting industry, industry-funded university research, jointly owned or shared laboratory facilities, consortia, consultation, industrial liaison, industrial park, and personnel exchange. The following concerns for institutions are important: where external support will come from, how the relationship will be initiated and governed, and how industry contact can be established. (SW)

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AASCU INSTITUTIONS AND INDUSTRY:
Partners in Progress

Lawrence B. Logan
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AASCU STUDIES 1984/1

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FOREWORD

"Comprehensive colleges and universities" is the term being increasingly applied to the member institutions of the American Association of State Colleges and Universities. The search for a fuller understanding of that term makes an appropriate demand on our time and attention. If we accept the common view that teaching, research, and service constitute the tripartite mission of colleges and universities, then we must ask how these comprehensive institutions fulfill that mission. The question arises because the predominant historical function among them was not comprehensive but single purpose. As a consequence, in the minds of many, the AASCU institutions must clarify their niche in the higher education community.

Larry Logan's work is a very significant contribution to that clarification. It is significant because it adds to the base of knowledge about AASCU campuses, and because it reveals their potential for major enhancement of their research and service programs. Moreover, it provides an illustration of university corporate collaboration. Thus, the ideas and suggestions that Dr. Logan offers should prove very useful to AASCU member institutions, and to many others who need to gain a more cogent awareness of these institutions as a major national resource.

—Harold Delaney
Executive Vice President
AASCU

ABOUT THE AUTHOR

Dr. Lawrence B. Logan has had an extensive career in the steel, brewery, and computer industries before entering the field of higher education. He has taught accounting and finance in the business division at the University of Wisconsin-Parkside, where he is presently the Executive Assistant to the Chancellor. At the University of Wisconsin-Parkside, Dr. Logan created and developed a precollegiate program called CHAMP, which gained national acclaim when the National Commission on Excellence in Education chose it as an exemplary program. The program also was adopted as a model for other campuses in the University of Wisconsin System.

Dr. Logan earned a bachelor's degree in accounting from Roosevelt University, an M.B.A. in finance from the University of Chicago, and a Ph.D. in higher education administration from the University of Wisconsin-Madison.

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AASCU INSTITUTIONS AND INDUSTRY:
Partners in Progress

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Many articles have been written recently about the cooperative relationships between universities and industry. (See, for example, Mattenberg, 1980; Bok, 1981; Dietrich and Sen, 1981; Hancock, 1983; Linnel, 1981; Moss, 1983; Praeger and Omenn, 1980; Tatel and Guthrie, 1983; Trotter, 1982; Turner, 1983; and Useem, 1983.) Thus far, however, primary attention has been limited to large research-oriented universities and their interactions with large corporations. Aside from a single notable study by Darknell (1981), which focuses specifically on the interactions between industry and faculty members in California, very little material exists on the relationships of state colleges and universities with industry. Yet, a substantial number of these public "comprehensive" institutions, originally funded to provide teacher education, and still lacking a formal identification as research institutions, are developing multifaceted relationships with industry. And by these ties, they are helping attract new industry and more financial resources to their communities.

A recent national study by the author found a widespread perception of mutual benefits stemming from the working relationships between industry and the member institutions of the American Association of State Colleges and Universities (AASCU) (Logan, 1983). AASCU member institutions are providing opportunities for faculty and staff to apply and develop their professional expertise, to improve the preparation of their students for employment in industry, to obtain additional funding for research, and to enhance the instruction, research, and public service capabilities of their institutions. As stronger relationships emerge through joint projects, such as exchanges of personnel, public service, or sharing of equipment, not only do the universities and businesses benefit, but so also do the communities and regions AASCU institutions are mandated to serve.

Much of the specific information gleaned from the examination of these relationships points a path for AASCU institutions to follow. To that end, this essay reviews the more pertinent findings of the study and

outlines the major benefits and pitfalls of developing cooperative relationships with industry.

The Survey

To assess the nature and extent of these relationships, the author surveyed the 236 public institutions classified by the Carnegie Council on Higher Education as Class 1 comprehensive college and universities (those offering degrees in the liberal arts and in at least two professional fields). Of these, 66 were found to be active in four or more industry-related programs, and 57 (or 86 percent of the group) responded to the following questions: 1) what are institutions seeking to accomplish with industry? 2) how are programs linking universities and industries supported financially? 3) how are these programs governed? 4) which departments and faculty are most frequently involved with industry? and 5) what kinds of services do universities provide industry?

Using a categorization scheme designed by Walter S. Baer (1978), the industry-related programs were divided into two types: 1) collaborative research mechanisms, that is, arrangements designed to foster joint research projects or less formal cooperative relationships directed at a specific research mission; and 2) knowledge transfer mechanisms, that is, programs that contribute primarily to broad-based information exchange between universities and industry. The following list provides examples of both types:

Collaborative Mechanisms

- Government-Funded University Research Assisting Industry
- Industry-Funded University Research
- Jointly Owned or Shared Laboratory Facilities
- Consortia

Knowledge Mechanisms

- Consultation
- Industrial Liaison
- Industrial Park
- Personnel Exchange

The 57 institutions that are making efforts to develop the industry-related programs described above represent all regions of the United States: 5 in the eastern region; 18 in the southern region; 21 in the central region; and 13 in the western region. The individual states with the highest numbers

of institutions involved in such industry-related programs were Michigan (7), Alabama (5), California (5), and Wisconsin (4). Each type of program is represented in all regions, except for industrial parks and jointly owned and shared laboratory facilities. Of the eight industrial parks, four each are located in the central and southern regions. Of the eight jointly owned or shared laboratory facilities, five are in the central, two in the southern, and one in the western region.

Although the institutions were not asked to what extent geographical proximity to the industrial clients was or was not a factor, the fact that 67 percent of all respondents reported that their industrial clients were within a 25-mile radius of their campus suggests the role geography plays in fostering or hindering the development of university-industry relationships. Further research is needed to expose the barriers to establishing such relationships, or the effect of the absence or existence of a neighboring industrial community.

Findings

The following eight programs describe the efforts that 57 state colleges and universities are making in developing working relationships with industry.

Government-Funded University Research Assisting Industry

Forty-nine state colleges and universities indicated they had developed government-funded university research programs because of increased demands from industrial-business firms located in their service area. Many stated that the growing recognition of institutional capabilities and new faculty interest have been prime reasons for more interest in the program. Factors that seemed to influence the effectiveness of government-funded programs were the amount of resources (funds, manpower, and equipment) committed, the leadership ability of the project coordinator, and the time frame under which the project operated. Grants to such programs were often viewed as seed money, which would be augmented or replaced by contributions from the industrial participants. Respondents indicated that university funds were used in combination with federal and state government contributors, the private sector, and local governments.

Some governmental efforts have been purposely designed to stimulate the development of university-industry research programs. For example, the National Science Foundation (NSF) has initiated various cooperative research and development programs with higher education, and NSF's Industrial-University Cooperative Research Program encourages a closer research relationship between university and industrial personnel.

From such efforts, state colleges and universities stated their programs had been instrumental in establishing local businesses, and that 94 percent were self-supporting. The number of businesses started by various universities ranged from 1 to 165, with a median of five. Respondents added that if administrative support continues to increase as expected, it is probable that this program's efforts will yield significant educational benefits.

The creation of such a program is not viewed as an easy task. It requires a faculty and staff with specialized knowledge, as well as sophisticated instrumentation to meet industry's needs, and an industrial partner with the necessary research and development capabilities. To date, departmental participation among faculty has been greatest in the areas of business, biological sciences, physical sciences, and engineering, with their efforts generally focused on small businesses rather than on large corporations.

Industry-Funded University Research

Contracting for university services by industry occurred in 49 of the 57 state colleges and universities surveyed. Universities overwhelmingly believe that industry contracts for their services because of the specialized knowledge of the faculty in a given research area and because the university can offer sophisticated instrumentation that meets industry's needs. Some believe industry is also recognizing the economic advantage associated with funding research and that as industrial associates grow, so will industry-funded research programs. Using the knowledge and technology offered by universities allows industry to obtain new products and processes without having to expand, establish, or maintain in-house research capabilities. University incentives are equally compelling: the potential for long-term research support, a broader educational experience, industrial exposure, and employment opportunities for students. The growing need of faculty for outside work and the need to expand the level of research funding encourage many institutions to help faculty locate potential industrial sponsors.

University services offered to industry are consultation, lectures and training on company sites, utilization of university equipment, and equipment demonstrations on campus. Again, the departments most active in offering these services are engineering, business, and the physical and

biological sciences. Most universities indicated that start-up funds for programs in this category were obtained from the private sector. Others obtained support from university funds or from state and federal governments. Excluding income earned by individual faculty members, universities reported revenues from these programs ranging from $15,000 to $8,000,000 in 1982.

Jointly Owned or Shared Laboratory Facilities

Collaboration of university and industry staff enriches scientists from both sectors, enabling them to engage in a variety of research methodologies. Joint procurement of equipment offers savings to such teams, who might otherwise purchase similar hardware individually. Only 8 of the 57 universities indicated that they were a part of a jointly owned or shared laboratory facility, possibly because such a program requires partners from each sector whose needs are very similar and yet costly enough to encourage sharing.

Besides expanding the knowledge/experience pool of participating engineering and biological scientists, the sharing of laboratory facilities enables graduate students to deal with real-world problems while learning. The recognition of mutual benefits explains why start-up funds for jointly owned or shared laboratory facilities come primarily from private industry and the university.

Respondents believed that new activities and the trend in all institutions to minimize equipment costs would aid the expansion of programs in this cateogry. At the same time, they were aware that the most important constraint on the development of joint laboratory facilities is distance. Participating firms should be located close enough to campus to facilitate frequent exchange of faculty and staff. All universities presently involved in joint laboratory facilities arrangements indicated that the laboratories were located on campus, with one exception, which was located approximately 30 miles from campus.

Consortia

Twenty-two of the surveyed institutions (39 percent) provided membership in a consortial program. Such programs involve a common interest in basic or applied research on a problem of concern to an entire industry. A consortium provides the opportunity for a individual university to relate to a number of companies in an area in which the university has an outstanding capability and the companies share a need for research. Member companies pay a fee to support university research of generic interest to

an industry. As research developments occur, they are communicated to the sponsoring companies through special reports or informed briefings. Eighty-two percent of the consortial respondents reported that their involvement with industry was likely to increase. They believe that as their reputation grows, so will their ties to industry. Many institutions anticipate a more active interchange with industry because of growing local activity in high technology programs. Thus, they are actively trying to develop the local industrial base. This development is encouraged especially by business and engineering faculty who would be most likely to benefit from expanded exchanges.

Under the consortial arrangement, the surveyed universities provided faculty consulting services to their clients, while approximately 70 to 80 percent also offered lectures on company sites and on campus. Some universities encouraged industry access to university equipment and information resources.

Start-up funds for the consortia were obtained from both private sector and university funds. Two universities reported receiving funds from state government. Annual fees charged clientele for participating ranged from $1,500 to $100,000. Approximate revenues generated through a consortial arrangement last year ranged from $5,000 to $400,000.

Consultation

Data show that all 57 institutions (100 percent) reported having a consulting program. Consulting faculty members offer their knowledge and professional expertise to the public for free or on a fee-for-service basis. This contact is generally believed to keep faculty in touch with the latest developments in their fields, and in some cases, up-to-date on employment opportunities for their students. Some respondents expressed concern that consulting could develop into a conflict of interest for the faculty member. On the other hand, many saw consulting as an ideal way for faculty members to supplement low salaries.

Unlike the other categories, whose activity was generally confined to science and engineering faculty, consulting offers all faculty disciplines the opportunity to bring their ideas and concepts to the public at large. Because of the strong mutual interest of industry and faculty, administrators often find it both necessary and increasingly useful to allow faculty members, particularly in fields such as data processing and engineering, to consult actively with industry, as long as this kind of activity does not hinder classroom performance or other academic responsibilities.

Ninety-five percent of the participants in the survey responded positively when asked if their institutions were likely to expand their con-

sulting relationships with industry. A high degree of interest, a growing need in the community, extreme need for school funding from nonstate sources, and attraction and retention of qualified faculty were among the reasons given for the positive responses.

Faculty consulting was greatest in the business department, followed by engineering, physical science, biological science, social science, and education. Consultation rates for faculty working on an institutional project varied. Fifty-four percent replied their rates varied according to a faculty member's individual salary; 32 percent used external consultant standards; 12 percent used the maximum allowable rates of the funding agencies; and 5 percent used established internal rates according to faculty rank. Some institutions had no policy.

Institutional policies on days allowed faculty members for external consulting varied as well. Forty-seven percent of the respondents allowed one day a week, 42 percent noted a flexible policy as long as classes were not affected, and seven percent had no policy. Some policies stipulated that if outside work involved more than eight hours per month, administrative approval was required. Other policies allowed one-sixth of time during an academic year or two days per month. Although specific data on consulting were difficult to obtain, it was clear that consulting is the most extensively practiced relationship with industry.

Industrial Liaison

Twenty-six state colleges and universities participated in industrial liaison programs. Such a program focuses on a specific technological area and permits industry to become involved in ongoing research activities at the institution. New concepts may be generated through the transfer of knowledge between the academic and industrial sectors, thus contributing to the knowledge/experience pool of those involved.

Ninety-six percent of those participating in industrial liaison programs believed their programs were likely to expand because of increased university interest. Some stated that industry was expanding rapidly in their area, and if the programs proved successful, industry's interest would help promote the college as well as bring funding. Thirty-four percent of the responding institutions indicated that their business and engineering faculty were most active in industrial liaison arrangements. Only a few reported activity in other departments.

Respondents identified their clientele as a combination of both small businesses and large corporations; they also believed that clients contracted for university services primarily because of their faculty's specialized knowledge. Fifty percent indicated that their clients' affiliations with the univer-

sity or faculty met a morale need of management and/or scientific staff; some reported they were a resource for evaluating and testing their clients' products. Twenty-three percent reported that the university owned sophisticated instrumentation helpful to industry and reported that the client contracted university services because of the high cost of maintaining necessary lab equipment and personnel. Other reasons given were the education of engineers through internship experiences, and rapid technology transfer benefits.

Start-up funds for the industrial liaison program were provided primarily by the private sector and the university. Other sources of start-up funds included state government, fees generated through continuing education activities, and contributions from area industry, school funds, and foundations. Many of the respondents recorded no predetermined charges for members participating in their programs. Among those reporting such charges, annual fees ranged from $50 to $25,000, and generated from $10,000 to $275,000 at individual institutions.

Industrial Park

Only eight (14 percent) state colleges and universities (six with enrollments of less than 10,000) have ventured into industrial park programs, and they perceived such programs to be too new to evaluate.

Participants in industrial park ventures all believed that their programs were likely to expand in the future and offered several brief explanations to support their view: the university had a very positive relationship with the industries in the research park; graduates regularly found employment in high tech firms located in these parks; institutions were actively looking for ways to expand relationships; such expansion was college policy; and the expansion reflected the efforts and enthusiasm of the development center and the president.

Respondents identified the following administrative units as being most involved with the industrial park: office of president, division of research and public service, division of continuing education, school of engineering and mathematics, school of public and environmental affairs, bureau of industrial development, business development, engineering tech, and grants and contracts department. Their efforts helped establish businesses in the local community of which 75 percent were self-supporting. All universities offered faculty consultation to their clients, and some offered lectures on company sites and on campus. use of university equipment, and access to literature.

Respondents agreed that the value of an industrial park was enhanced by the willingness of its tenants to disseminate research results and partic-

ipate in education programs at the host university. All participants indicated that this program had enriched their knowledge/experience pool, as scientists from both sectors were able to communicate with each other. Eighty-eight percent of respondents indicated the program also allowed students the opportunity to experience real-world problems while learning.

Fifty percent of the respondents indicated their start-up funds for the industrial park were obtained from the private sector and the university itself. Sixty-seven percent of the smaller universities reported that a part of their start-up funds was donated by the private sector, while 50 percent of the larger universities received their funds from the university. One university indicated it had borrowed money from a bank to start the venture.

Personnel Exchange

Some firms encourage their professional staff to teach or to conduct research at nearby universities, and, in turn, faculty and students find employment opportunities with industry. This exchange, which develops trained personnel, enhances the knowledge/experience pool and strengthens the ties between the two sectors, was undertaken by forty-two (74 percent) of the 57 surveyed state colleges and universities. Specifically, seventy-nine percent of the respondents indicated that their faculty were placed in the industrial and business sector to consult, while 71 percent placed faculty to assist research projects, and 64 percent used faculty to supervise students who were interns or who worked in cooperative programs. Respondents agreed that their faculty visited the industrial sector on occasion; better than half stated that their faculty visited industry during the summer, one-third visited for a semester or quarter, and one-fifth between semesters or quarters.

Ninety-three percent of the surveyed universities use corporate volunteers for teaching duties, and 71 percent use corporate personnel for supervising and preparing students in industry. Few universities, however, allow corporate personnel to participate in their administrative or management duties.

Initial Considerations

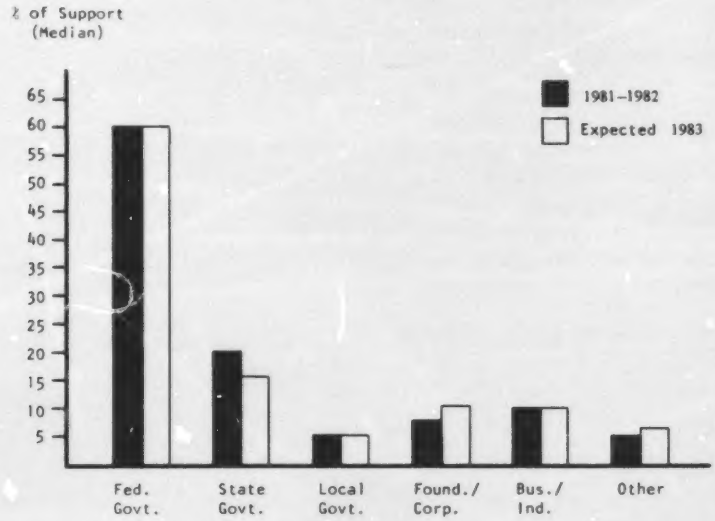
The results of the study make clear that any institution considering entering a program with industry as a partner should be concerned about where

external support will come from, how the relationship will be initiated and governed, and how industry contact can be established.

What Support Is Available?

External funding for sustaining institutional linkages with industry primarily has come from the federal and state government (See Figure 1), however, the expectations for governmental funding next year do not exceed the amount funded the past three years. Apprehension about government support has been coupled with other financial problems of the university brought on by the recession and inflation. Even though media sources report universities are looking to industry as a possible source of funds, state colleges and universities are not expecting such a trend. To fill the gap, state colleges and universities hope that funding from their own foundations and corporations will increase (See Figure 1).

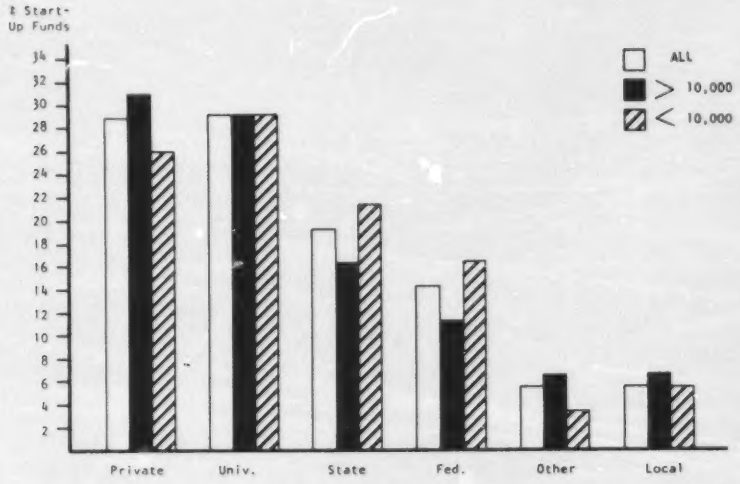
Figure 1
External Support Received 1980, 1981, 1982 Compared With Expected External Support for 1983



A substantial portion of start-up funds for sponsoring university-industry collaborative efforts among all surveyed institutions comes from the private sector and the university itself (See Figure 2). After the Government-Funded University Research Assisting Industry program, which is primarily supported by the federal and state governments and the university, the private sector is the primary source of initial funding for most programs linking universities with industry. Universities also show a strong commitment to initiating linkages with industry through the use of their own funds and personnel. Despite their efforts, it seems clear that the use of outside funds from both federal and state government will remain in the near future the main source of revenue for all institutions.

Figure 2

Start-Up Funds for Consortia, Government Funded University Research, Industry Funded University Research, Industrial Park, Industrial Liaison, Jointly Owned Laboratories



Support for staff salaries, materials, overhead and office space can be generated from revenue earned and from the university. Some offices and staff are self-supporting, some are supported by the university, and still others share support from both of these sources. External support foundations and centers aid activities at some campuses. The purpose of such organizations, generally nonprofit and tax exempt, is to enter into projects for the benefit of the university. Other university foundations do not promote programs but become involved in the contractual and patent rights aspects of each program. In either case, university foundation staff seek funding from state and federal agencies, private foundations, and the business community.

How Are Relationships Governed?

Most active institutions have formally stated policies to govern the behavior of those who participate in their university-industry programs, but few have set specific rules. Examples of such policies to govern the behavior of participants in university-industry programs are listed below:

- Any activities should be consistent with university goals.
- Use of university materials and facilities requires reimbursement.
- An administrator or a committee has responsibility for approving any outside faculty research agreements with industry.
- Faculty having ownership or substantial financial or policy roles with organizations, companies, and agencies with which the university does business presents a conflict of interest.
- Outside activities will be limited to a specified time or course equivalent.
- Proprietary rights, licensing, and patent rights for products developed from industry support shall belong to the supporter unless otherwise agreed on.
- Faculty must submit an annual written disclosure report.
- University faculty, staff, and students are required to sign a "confidentiality agreement" to safeguard use, disclosure, or publication of a funding agent's confidential information.

Governance of university-industry linkages is strengthened when universities assign offices and staff personnel to facilitate the functions of their programs. Such offices are listed as centers for professional development, or offices of research and development. A director or dean generally

is assigned the duties of overseeing operations; a few institutions assigned such duties to a president or executive dean. Efforts of such offices and staff are aimed at improving their communication with industry through informal and formal meetings, open houses, seminars, workshops, and faculty contacts. To assist in developing the interaction between university faculty and staff with industry, some institutions compile directories to apprise their clients of the diversity of expertise available at their campuses. These directories also help intracampus personnel to locate specific resource persons for specific needs.

How To Get Started?

Dialogue and understanding between the university and industry have been enhanced by forming advisory councils with the responsibility for the conduct of their university-industry programs. Such councils consist of senior technical officers representing primarily local industries. Occasionally the members are presidents or board chairmen of moderate-size companies (Swalin, 1976). Membership ranges from 6 to 60 with a median of 15 persons. Members for such groups are selected primarily by university administration or the chancellor/president on advice of a faculty group. Although there are instances where deans or board members select council members, according to Swalin (1976), appointment of members by the chancellor/president of the university adds stature to the council and suggests that it reports directly to the head of the institution. The survey revealed that while most state college and university councils are chosen by the administration, chancellor, or president, some are selected by industry, department chairpersons or deans of schools, the board itself, or the board on the advice of the faculty.

Personal contact was indicated by all as the method used for contacting and initiating cooperative projects with industry. Information brochures, contact with legislators, public media such as ads, television, radio, and newspapers were also used. Data indicated that when creating university-industry linkages internal factors were viewed as more important than external factors. The principal internal sources most often cited by respondents as initiating cooperative projects with industry were the institutional departments, bureaus and/or centers, the individual faculty or staff members, and the university-industry offices or personnel assigned for such purposes. As might be expected, those individuals and units most active in initiating linkages with industry were those actually involved with the exchange of ideas and expertise.

Benefits

On the whole, institutions are optimistic about the kinds and range of advantages that could be anticipated from their relationships with industry. It is clear that they are becoming more active in their solicitations, and their faculty are showing more interest in enhancing the research capabilities of their academic units and in educating their students about career possibilities.

The study revealed that a number of benefits accrue to both colleges and universities and businesses that participate in these cooperative arrangements. University-industry relationships provide a variety of opportunities for faculty and staff to expand/increase their expertise. Many, if not most, faculty have spent their entire professional lives in educational institutions and have had little or no exposure to the industrial world. They can learn more about industry and its methods, techniques, and current technology. This helps faculty and staff not only to keep up-to-date in their fields, but also to fill possible voids in their educational backgrounds. Collaborative opportunities with industry help faculty become better informed and thus more effective teachers and researchers. Faculty not only gain knowledge in their fields but also participate in ongoing projects, summer employment, and consulting.

Contacts that faculty make with industry and the relationships that often result expand possibilities for internships and coopeative programs for students. Students are the direct beneficiaries of information presented by faculty who are up-to-date in industrial and technical knowledge and methods. The opportunity to work with projects in the "real world" rather than in simulated laboratory exercises produces students who are well acquainted with the industrial environment and emerging specializations and makes them more desirable graduates in the eyes of industry.

Industry also benefits from collaborative projects with state colleges and universities. Interaction with these institutions provides industry with access to specialized scientific equipment as well as a steady supply of well-educated graduates and university scientists.

In addition to enhancing professional development, the diversified support received from industry for various academic programs offers state colleges and universities some fiscal flexibility beyond state support. These state colleges and universities have traditionally been more dependent on state support than the major doctoral degree granting research universities, which have always been perceived as having "official" research responsibilities. Public policy makers, however, have generally overlooked the fact that state colleges and universities, in addition to serving community

residents that cannot travel to distant educational institutions, can play an increasingly important role with industry and gain added financial support. This is not to say that corporate funding will make universities independent; however, universities working with industry, in addition to improving their educational programs for faculty, staff, and students, can also increase the number of sources contributing to an institution's financial base.

When an institution considers collaborating with industry, it should not hope for quick solutions to financial problems, since productive collaboration is not quickly accomplished. The first step should be to look for support to improve current programs. Although respondents to the author's national survey indicated that unrestricted gifts and direct financial support would indeed be ideal forms of support, few suggested that this was actually occurring.

Beyond money, businesses have much to share with schools in terms of managerial expertise, new technologies, and capabilities. Some state colleges and universities have formal executive-in-residence programs in which active, semi-retired and retired businessmen, ranging from chief executive officers to middle managers, spend extended periods working with students. This allows the business executive to become more aware of what is being taught and researched at a university and more intimately involves faculty and students with experiences both in and out of the classroom.

Corporate volunteers teach, supervise, and prepare students in industry through internships and cooperative programs. Some volunteers visit the campuses periodically, while others are assigned for the full semester or academic year. When an executive chooses to participate in the academic activity of a university, he or she adds strength to university instruction and research. Keeping up-to-date is particularly urgent in disciplines where change is rapid, and the latest developments essential to content. Industry may offer faculty sabbaticals, invite faculty for consulting, and hire graduates.

Society can benefit from state and university linkages with industry because students at many state colleges and universities have limited mobility. Many students, as well as adults seeking retraining or continuing education will, for a variety of reasons, stay close to home, even after graduation. Their new-found knowledge and skills applied to local industry contribute directly to the total economic strength and stability of their communities.

It may be that state legislatures will recognize these improvements in their constituents and will encourage networks between the university and industry by providing resources to release faculty from their heavy

teaching loans for further research and other nonteaching activities. With tighter linkages, industry leaders and educators can make the case that the welfare of industry may depend more and more on the basic infrastructure of research at universities.

Cautions and Concerns

While some universities have made progress in their relationships with industry, others fear that such affiliations, if not carefully managed, may lead to serious problems. They point to the different research goals of the two groups. Since the primary goals of a university are education and training, its research is conducted for the extension of fundamental knowledge. Such research is generally long-term, and is expected to be accessible to interested colleagues. On the other hand, industry's primary research goal is often short-term, and relies on applied research to maintain a firm's competitive edge in the development of profitable products. Thus, the argument runs, the profit motive can clash with the values of academic freedom.

There are indeed risks associated with the university-industry ventures. For example, in discussing the problems associated with industrial parks, William P. Little cautions that a research park must be viewed as long-term and high-risk. Although the promise of more jobs and dollars has persuaded many to believe they can develop a research park, he warned that planners face the dangers of insufficient capital, an unqualified labor pool, uncooperative local governments or universities, inexperienced or poor developers, a poor transportation network, lack of potential tenants, intense competition for research in some areas, and an inability to wait 10 to 15 years for success because of a need to show immediate or short-term results." (Little, 1982).

Perhaps the lesson to be learned is that universities must not act prematurely and attempt to become a Silicon Valley or a North Carolina Research Triangle Park. Most institutions do not have the proper mix of university and industry expertise to make such ambitious plans a reality. What this study reveals is that state college and university faculty and staff can, as a *first* step, aid the economic development of small businesses in their communities. Many small businesses are unable to pay the membership fee of a consortium or industrial liaison program such as those at Massachusetts Institute of Technology, Carnegie-Mellon, or Stanford, but could turn to state college and university faculty for help with their busi-

nesses. If a particular problem proves too difficult, state colleges and universities and the research-oriented university can often work together on a solution. For example, many Ph.D.-level faculty members on smaller campuses were trained at large research universities, and can turn to their mentors for help. And the resulting three-way cooperation offers many of the same benefits outlined above. A similar situation occurred in nineteenth-century Wisconsin. There, farmers first sought help from their county agent; when the agents didn't have the answer, the farmers then turned to the Madison campus of the University of Wisconsin (Curti and Carstensen, 1949).

A Path for Others to Follow

The path is clear. State colleges and universities start with limited objectives to prepare students for employment, enhance the research, instruction, and public service capabilities of their institutions, and provide faculty and staff the opportunity to apply and develop their professional expertise. As institutions pursue these aims, they frequently become involved with more complex activities and thus develop a capacity for greater public service through programs that benefit the university, industry, and society. Such involvement enhances faculty awareness of the needs of small- and large-scale industry.

Consequently, as faculty interact regularly with business and industry, the gap in understanding between the university and industry narrows. And, as this essay has illustrated, the efforts made by state colleges and universities to narrow that gap reap benefits for all those involved. Thus, the development of industry-university partnerships would appear to be an opportunity state colleges and universities cannot afford to miss.

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